IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: JONES, MICHAEL A. DOCKET NO.: 5217.61003

SERIAL NO.: 09/199,908 FILED: 11/25/98

PATENT NO.: 5,975,892 ISSUED: 11/02/99

TITLE: PNEUMATIC FLASH CALCINER THERMALLY INSULATED IN FEED STORAGE SILO

Box Reissue
Director - USPTO
Washington, D.C. 20231

Durando Birdwell & Janke PLC
2929 E. Broadway Blvd.
Tucson, Arizona 85716
520-881-9442
520-881-9448 Fax

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service utilizing the **"EXPRESS MAIL POST OFFICE TO ADDRESSEE"** service, mailing label number **EL916899436US**, under 37 CFR 1.10 in an envelope addressed to: Box Reissue, Director - U.S. Patent and Trademark Office, Washington, D.C. 20231, on the 2nd day of November, 2001

By Kathleen C Tennant
Kathleen Tennant

TO THE DIRECTOR OF THE U.S. PATENT AND TRADEMARK OFFICE

REISSUE PATENT APPLICATION AND AMENDMENT

Dear Sir:

In accordance with 37 CFR 1.171-1.173, a Reissue Patent Application for U.S. Patent No. 5,975,892, entitled "Pneumatic Flash Calciner Thermally Insulated in Feed Storage Silo," issued on November 2, 1999, is being submitted herewith. The entire

specification, including the drawings and claims of the original patent, are enclosed. Pursuant to 35 U.S.C. 251, this reissue application is being filed within the two year deadline for claims that enlarge the scope of the original patent.

Also submitted herewith is an amendment directing the entry of the changes and new claims described below.

Please amend the above-entitled application as follows:

IN THE CLAIMS:

a. Please amend the following claim:

10. (Amended) The plant of Claim [9] 2, wherein said calcination reactor has a substantially cylindrical bottom portion including a fuel burner and said fluidized feed stream is introduced tangentially in the bottom portion such as to produce a cyclonic flow through the reactor.

b. Please enter the following new claims:

20. A calcination plant for a particulate feed material comprising:

a calcination reactor; and

means for effecting transport of the particulate feed material through said calcination reactor along a substantially cyclonic flow path.

21. The plant of claim 20, wherein said effecting means comprises means for introducing the particulate feed material into said calcination reactor substantially tangentially of said calcination reactor.

22. The plant of claim 20, further comprising means for creating a heat source within said cyclonic flow path.

23. The plant of claim 22, wherein said calcination reactor is substantially vertical and has a bottom portion, said effecting means comprising means for introducing the particulate material into said calcination reactor substantially tangentially of said bottom portion, and said cyclonic flow path extending upwards from said bottom portion, said creating means being mounted in said bottom portion.

24. The plant of claim 22, wherein said creating means comprises a burner.

25. The plant of claim 20, further comprising a storage silo for the particulate feed material, means for fluidizing the particulate feed material prior to storage and for conveying a

resulting fluidized feed stream to said storage silo, a first heat exchanger, a second heat exchanger and a solid-gas separation unit, said effecting means constituting part of means for fluidizing the particulate feed material from said storage silo and for sequentially conveying a resulting fluidized feed stream through said calcination reactor and said solid-gas separation unit to produce a solid calcined product and a gaseous exhaust, said first heat exchanger being located between said gaseous exhaust and a reactor air stream used for fluidizing the particulate feed material conveyed to said calcination reactor, and said second heat exchanger being located between said gaseous exhaust and a feed air stream used for fluidizing the particulate feed material conveyed to said storage silo, said solid-gas separation unit, said first heat exchanger and said second heat exchanger being located in said storage silo and at least partially immersed in the particulate feed material therein.

26. The plant of claim 25, further comprising means for injecting a silo air stream into said storage silo.

27. A method of operating a calcination plant for particulate feed material comprising the step of transporting said particulate feed material through a calcination zone along a substantially cyclonic flow path.

28. The method of claim 27, further comprising the step of introducing said particulate feed material into said calcination zone substantially tangentially of said calcination zone.

29. The method of claim 27, further comprising the step of creating a heat source within said cyclonic flow path.

30. The method of claim 29, wherein the creating step comprises generating a flame within said cyclonic flow path.

31. The method of claim 27, further comprising the steps of storing said particulate feed material in a storage space prior to the transporting step, fluidizing said particulate feed material with conveying gas prior to the storing step, heating said conveying gas prior to the fluidizing step, entraining said particulate feed material with transporting gas prior to the transporting step, heating said transporting gas prior to the entraining step, and separating said particulate feed material and said transporting gas in a solid-gas separation zone following the transporting step to produce a solid calcined product and a gaseous exhaust, said calcination zone and said solid-gas separation zone being located in said storage space, and the storing step including conveying the fluidized particulate feed material into said storage space and at least partially immersing said calcination zone and said solid-gas separation zone in said particulate feed material, the steps of

heating said conveying gas and heating said transporting gas being performed in said storage space using gaseous exhaust from said solid-gas separation zone.

32. The method of claim 31, further comprising the step of injecting a fluidizing gas into said storage space.

33. A method of operating a calcination plant for particulate feed material comprising the steps of:

storing said particulate feed material in a storage space;

removing said particulate feed material from said storage space;

entraining said particulate feed material with transporting gas following the removing step;

transporting the entrained particulate feed material through a calcination zone; and

separating said particulate feed material and said transporting gas in a solid-gas separation zone following the transporting step to produce a solid calcined product and a gaseous exhaust, said calcination zone and said solid-gas separation zone being located in said storage space, and the storing step including at least partially immersing said calcination zone and said solid-gas separation zone in said particulate feed material.

34. The method of claim 33, further comprising the steps of fluidizing said particulate feed material with conveying gas prior to the storing step, heating said conveying gas with gaseous exhaust from said solid-gas separation zone prior to the fluidizing step, and heating said transporting gas with gaseous exhaust from said solid-gas separation zone prior to the entraining step, the storing step including conveying the fluidized particulate material into said storage space, and the steps of heating said conveying gas and heating said transporting gas being performed in said storage space.

35. The method of claim 34, further comprising the step of injecting a fluidizing gas into said storage space.

36. A method of operating a calcination plant for particulate feed material comprising the
steps of:

admitting said particulate feed material into a calcination zone;

transporting said particulate feed material through said calcination zone; and

adjusting the temperature in said calcination zone, the adjusting step including varying the rate of admission of said particulate feed material into said calcination zone.

37. The method of claim 36, wherein the transporting step comprises conveying said particulate feed material through said calcination zone along a substantially cyclonic flow path.

38. The method of claim 37, wherein the admitting step comprises introducing said particulate feed material into said calcination zone substantially tangentially of said calcination zone.

39. The method of claim 37, further comprising the step of creating a heat source within said cyclonic flow path.

40. The method of claim 39, wherein the creating step comprises generating a flame within said cyclonic flow path.

41. The method of claim 36, further comprising the steps of storing said particulate feed material in a storage space prior to the admitting step, fluidizing said particulate feed material with conveying gas prior to the storing step, heating said conveying gas zone prior to the fluidizing step, entraining said particulate feed material with transporting gas prior to the transporting step, heating said transporting gas prior to the entraining step, and separating said particulate feed material and said transporting gas in a solid-gas separation zone following the transporting step to produce a solid calcined product and a gaseous exhaust, said calcination zone and said solid-gas separation zone being located in said storage space,

and the storing step including conveying the fluidized particulate feed material into said storage space and at least partially immersing said calcination zone and said solid-gas separation zone in said particulate feed material, the steps of heating said conveying gas and heating said transporting gas being performed in said storage space using gaseous exhaust from said solid-gas separation zone.

42. The method of claim 41, further comprising the step of injecting a fluidizing gas into said storage space.

REMARKS:

Original claims 1-19 and new claims 20-42 are pending in this reissue application. No claims have been canceled. Pursuant to 37 CFR 1.173(c), an explanation of the support in the disclosure of the patent for the changes made to the claims is provided herewith.

Support for Added Claims

Independent claim 20 recites a calcination plant for a particulate feed material that includes a calcination reactor and means for effecting transport of the particulate feed material through said calcination reactor along a substantially cyclonic flow path.

Explicit support for this claim is found in column 5, lines 22-36 of the original patent:

> The tangential flow of the feed into the calcining pipe provides the gradual blending of the feed material with the hot combustion gases, which results in avoidance of sintering of the feed material. The cyclonic action also increases the velocity of the fluidized particles for a given throughput and a given retention time in the reactor due to the spiral path that the material must follow.

Thus, an important aspect of the invention is the fact that a cyclonic flow path of the particulate feed material is advantageous over the prior art, in that producing cyclonic-type motion results in excellent heat transfer and optimal calcination. Specifically, larger particles migrate closer to the pipe wall and travel more slowly than smaller particles, thereby enabling the complete and uniform calcination of such coarser feed material. At the same time, the cyclonic action causes the finer material, which is calcined more rapidly than coarser material, to exit the reactor at a greater rate, which is all consistent with obtaining a product of uniform quality.

Dependent claims 21-26 add limitations found in the description of the preferred embodiment and claims of the original patent. Hence, claim 21 adds "means for introducing the particulate feed material into said calcination reactor substantially tangentially of said calcination reactor," which is disclosed in column 5, lines 11-14 ("the feed material is discharged...into the feed pipe 44 through rotary valves 30 and pneumatically conveyed

tangentially into the calcining zone of the reactor 14, thus producing a cyclonic action....").

In claim 22 a "means for creating a heat source within said cyclonic flow path" is recited. This limitation is described in column 2, lines 26-30:

> The feed material is kept in a fluidized state in the silo by air heated in the other heat exchanger and blown upward from the bottom of the storage compartment, from where the material is dropped into the feed pipe through rotary valves prior to injection into the reactor.

Claim 23 further defines the calcination reactor to be substantially vertical and having a bottom portion, with the effecting means of claim 20 "comprising means for introducing the particulate material into said calcination reactor substantially tangentially of said bottom portion, and said cyclonic flow path extending upwards from said bottom portion, said creating means being mounted in said bottom portion." These limitations are disclosed in claim 9.

Claim 24 simply defines the "creating means" of claim 22 to include a burner. A gas burner is disclosed in column 2, line 25.

Claim 25 defines the invention in terms of a whole silo storage and calcination reactor system, i.e.,:

> A storage silo for the particulate feed material, means for fluidizing the particulate feed material prior to storage and for conveying a resulting fluidized feed stream to said storage silo, a first heat exchanger, a second heat exchanger and a solid-gas separation unit, said effecting means constituting part of means for fluidizing the particulate feed material from said storage silo and for sequentially conveying a resulting fluidized feed stream through said calcination reactor and said solid-gas separation unit to produce a solid calcined product and a gaseous exhaust, said first heat exchanger being located between said gaseous exhaust and a reactor air stream used for fluidizing the particulate feed material conveyed to said calcination reactor, and said second heat exchanger being located between said gaseous exhaust and a feed air stream used for fluidizing the particulate feed material conveyed to said storage silo, said solid-gas separation unit, said first heat exchanger and said second heat exchanger being located in said storage silo and at least partially immersed in the particulate feed material therein.

This feed storage silo and calcination reactor configuration is disclosed in claim 1-6 and columns 3-5 of the Description of the Preferred Embodiments.

Claim 26 elaborates on the plant of claim 25, further defining "means for injecting a silo air stream into said storage silo." This limitation is disclosed in claims 16 and 17 and in column 3, line 53 ("injection nozzles 49").

For independent method claim 27, a method of operating a calcination plant for particulate feed material is disclosed to include "the step of transporting said particulate feed material through a calcination zone along a substantially cyclonic flow path." As discussed above for claim 19, claim 27 defines the

novelty of the invention in terms of the cyclonic flow path of the particulate feed material. Therefore, support for this claim is found in column 5, lines 22-36 of the original patent.

Furthermore, the inventive method of claim 27 is described in lines 10-15 of column 5: "the feed material is discharged from the silo's storage compartment into the feed pipe 44...and pneumatically conveyed tangentially into the calcining zone of the reactor 14, thus producing a cyclonic action that characterizes the flow of the fluidized reactants during calcination."

Thus, claim 27 is patentable over the prior art because it provides a method for calcining particulate feed material in a continuous operation that eliminates the need for refractory insulation, provides excellent heat transfer among all components, and keeps reactor temperatures sufficiently uniform for ideal calcination results through the cyclonic motion of the particulate feed (See, e.g., abstract; column 6, lines 19-30).

Dependent claims 28-32 track the language of the limitations found in the dependent device (plant) claims 21-26. Therefore, the same basis of support applies as discussed above.

Independent claim 33 recites:

A method of operating a calcination plant for particulate feed material comprising the steps of:

storing said particulate feed material in a storage space;

removing said particulate feed material from said storage space;

entraining said particulate feed material with transporting gas following the removing step;

transporting the entrained particulate feed material through a calcination zone; and

separating said particulate feed material and said transporting gas in a solid-gas separation zone following the transporting step to produce a solid calcined product and a gaseous exhaust, said calcination zone and said solid-gas separation zone being located in said storage space, and the storing step including at least partially immersing said calcination zone and said solid-gas separation zone in said particulate feed material.

This second independent method claim describes the entire calcination process. Thus, the steps of this method are disclosed in both in the Brief Summary of the Invention (column 2, lines 16-42) and the Description of the Preferred Embodiments (columns 3-6).

Claims 34-35 depend from claim 33. Again, these claims track the language of the limitations found in the previous dependent claims. Therefore, the same basis for support applies as was discussed above.

The last independent claim, 36, further recites:

A method of operating a calcination plant for particulate feed material comprising the steps of:

admitting said particulate feed material into a calcination zone;

transporting said particulate feed material through said calcination zone; and

adjusting the temperature in said calcination zone, the adjusting step including varying the rate of admission of said particulate feed material into said calcination zone.

The first two steps are disclosed in column 3, lines 23-50 (See, e.g., "the reactor feed consists of a fluidized stream of solid particles fed from the silo" (step 1) and "rotary valves 30...are used to mix the particulate solid feed with the air and create a fluidized feed stream for injection into the...[calcination] reactor through the tangential feed pipe 28" (step 2)). The third step of adjusting the temperature through varying the rate of admission of the feed material into the calcination zone is disclosed in column 4, lines 40-51.

Claims 37-42 depend from claim 36 and add limitations that are disclosed in the previous dependent claims and supported by the specification as described above.

The only formal correction made by this amendment is to claim 10. Claim 10, which duplicates the limitations of claim 9, has been amended to depend from claim 2 (rather then claim 9) to avoid redundancy.

Pursuant to 37 CFR 1.178(a), the patentee hereby offers to surrender the original patent, or if the original patent is lost or inaccessible, to file a statement to that effect.

Besides the enclosed filing fee, no other fee is believed to be due with this application and amendment. Should there be any unforeseen costs, please charge our Deposit Account No. 02-2451.

Respectfully submitted,

Antonio R. Durando
Reg. No. 28,409
(520) 881-9442 phone
(520) 881-9448 fax